

Application No. 09/591,443

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**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

- 1 1. (currently amended) An optical switch comprising:
  - 2 an array of side-by-side first optical paths;
  - 3 an array of side-by-side second optical paths, said first optical
  - 4 paths passing through said second optical paths at intersections;
  - 5 first and second ports at opposite sides of at least some of said
  - 6 first optical paths for propagating optical signals to and from said first optical
  - 7 paths;
  - 8 third and fourth ports at opposite sides of at least some of said
  - 9 second optical paths for propagating light to and from said second optical
  - 10 paths; and
  - 11 a plurality of two-state switching arrangements located at
  - 12 selected said intersections such that each said first optical path includes and
  - 13 is uniquely associated with a single one of said two-state switching arrange-
  - 14 ments, each said two-state switching arrangement having a transmissive state
  - 15 in which said first and second ports of said uniquely associated first optical
  - 16 path are coupled, each said two-state switching arrangement having a
  - 17 reflective state in which said first port of said uniquely associated first optical
  - 18 path is coupled to a particular said fourth port of a specific second optical
  - 19 path[.];
  - 20 wherein each said two-state switching arrangement is
  - 21 comprised of a first trench and a second trench, each said trench containing
  - 22 fluid responsive to manipulation such that by selective manipulation of said
  - 23 fluid in said trench each said trench is capable of switching between a
  - 24 reflective state and a transmissive state, each said first trench and said
  - 25 second trench being operatively associated such that said first trench and
  - 26 said second trench are simultaneously in one of a reflective and a
  - 27 transmissive state.
- 1 2. (cancelled)
- 1 3. (cancelled)

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1 4. (currently amended) The optical switch of claim 1 claim-3 wherein said  
2 two-state switching arrangements are located at specific said intersections to  
3 provide an add-drop switch ~~in which each said add port is uniquely associated~~  
4 ~~with a different output port.~~

1 5. (original) The optical switch of claim 4, wherein the number of first optical  
2 paths is equal to the number of second optical paths.

1 6. (cancelled)

1 7. (currently amended) The optical switch of claim 1, claim-6; wherein there  
2 is a one-to-one correspondence between said two-state switching  
3 arrangements and said first optical paths and wherein:  
4 said first ports are input ports;  
5 said second ports are output ports;  
6 said third ports are add ports; and  
7 said fourth ports are drop ports.

1 8. (original) The optical switch of claim 7, wherein each said first trench  
2 along a particular first optical path is located at said intersection of said  
3 particular first optical path with a corresponding one of said second optical  
4 paths.

1 9. (original) The optical switch of claim 8, wherein each said second trench  
2 along a particular first optical path is located along said first optical path at  
3 said intersection that is adjacent to said intersection at which said first trench  
4 of said two-state switching arrangements is located.

1 10. (original) The optical switch of claim 9, wherein the number of first optical  
2 paths is equal to the number of second optical paths.

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- 1 11. (currently amended) An optical switch comprising:  
2 a plurality of switching arrangements;  
3 N input optical paths having optically aligned waveguides that  
4 are operatively associated with a single switching arrangement, each input  
5 optical path having an input port at a first end and an output port at a second  
6 end;  
7 N drop signal paths having first ends at said switching arrange-  
8 ments and having drop ports at second ends, each said drop signal path  
9 being operatively associated with a single input optical path with respect to  
10 receiving optical signals therefrom;  
11 N add signal paths having add ports at first ends and having  
12 second ends at said switching arrangements, each said add signal path being  
13 operatively associated with a single input optical path with respect to trans-  
14 ferring optical signals thereto; and  
15 a controller for individually switching each said switching  
16 arrangement between one of a transmissive state and a reflective state, said  
17 switching arrangements being configured such that switching one of said  
18 switching arrangements from said transmissive state to said reflective state  
19 decouples said input and output ports of said operatively associated input  
20 optical path and couples said input port to a drop port of said operatively  
21 associated drop signal path[.], wherein each said switching arrangement of  
22 an operatively associated input optical path comprises:  
23 a first trench having a wall at a first intersection of said input  
24 optical path with said operatively associated drop signal path;  
25 a second trench having a wall at a second intersection of said  
26 input optical path with said operatively associated add signal path;  
27 a fluid within said first and second trenches, said fluid having a  
28 selected refractive index; and  
29 means for simultaneously manipulating said fluid within said first  
30 and second trenches to selectively switch said trenches in unison between  
31 transmissive states and reflective states, depending upon the presence or  
32 absence of said fluid at said first and second intersections.

1 12. (cancelled)

1 13. (cancelled)

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1 14. (currently amended) The optical switch of claim 11 wherein said input  
2 optical paths are in a parallel relationship claim 13 wherein each said optical  
3 path is parallel to and offset from said corresponding second optical path and  
4 wherein said intersections of said N drop signal paths and said N add signal  
5 paths with said [[first]] input optical paths form a matrix of (N+1) x N junctions  
6 having dimensions (N+1) x N.

1 15. (original) The optical switch of claim 11 wherein said input ports and add  
2 ports are operatively associated with wavelength demultiplexers and said drop  
3 ports and said output ports are operatively associated with wavelength  
4 multiplexers.

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1 16. (currently amended) An optical switching arrangement for manipulating  
2 optical signals among waveguides on a substrate comprising:  
3 at least three generally parallel first optical paths, each first  
4 optical path being formed by a plurality of spaced apart first waveguides;  
5 at least three generally parallel second optical paths, each of  
6 said second optical paths being dedicated to exchanging signals with one of  
7 said first optical paths, said second optical paths having first ends intersecting  
8 said first optical paths;  
9 at least three generally parallel third optical paths, each of said  
10 third optical paths being dedicated to exchanging signals with one of said first  
11 optical paths, said third optical paths having second ends intersecting said  
12 first optical paths;  
13 less than three fluid-containing trenches dedicated to each first  
14 optical path, each said fluid-containing trench having a sidewall at an inter-  
15 section of a specific first optical path with one of said second and third optical  
16 paths that is dedicated to said specific first optical path; [[and]]  
17 means for manipulating fluid within said trenches such that  
18 each said first optical path is limited to being in one of a specific transmissive  
19 condition and a specific reflective condition, said fluid enabling propagation of  
20 optical signals through said trenches along each first optical path when said  
21 fluid resides at said intersections; [,.]  
22 wherein each said first optical path has a dedicated first fluid-  
23 containing trench and a dedicated second fluid-containing trench, said  
24 sidewall of each said first fluid-containing trench being located relative to said  
25 intersection of said first optical path with said dedicated second optical path to  
26 reflect optical signals thereto when said first fluid-containing trench has an  
27 absence of said fluid at said intersection, each said sidewall of each said  
28 second fluid-containing trench being located relative to said intersection of  
29 said first optical path with said dedicated third optical path to reflect optical  
30 signals thereto when said second fluid-containing trench has an absence of  
31 said fluid at said intersection.

1 17. (original) The switching arrangement of claim 16 further comprising:  
2 input ports at first ends of said first optical paths;  
3 output ports at second ends of said first optical paths;  
4 drop ports at second ends of said second optical paths; and  
5 add ports at first ends of said third optical paths.

SUBSTITUTE AMENDMENT

1 18. (cancelled)

1 19. (cancelled)

1 20. (new) An optical switch for controlling propagation of signals through  
2 intersecting arrays of first and second optical paths, said first optical paths  
3 having input ports and drop ports at opposed ends, said second optical paths  
4 having add ports and drop ports at opposed ends, said optical switch  
5 comprising:  
6 a plurality of two-state switching arrangements located at  
7 selected intersections of said first and second optical ports such that each  
8 said first optical path is uniquely associated with a single said switching  
9 arrangement, each said switching arrangement having a transmissive state  
10 and having a reflective state in which said input port of said uniquely  
11 associated first optical path is coupled to a particular said output port of a  
12 specific said second optical path, said switching arrangements being con-  
13 figured such that said add ports remain optically decoupled from said drop  
14 ports regardless of switching between said transmissive and reflective states.

1 21. (new) The optical switch of claim 20 further comprising:  
2 a first demultiplexer having a plurality of first outputs, each said  
3 first output being dedicated to a particular one of said input ports;  
4 a first multiplexer having a plurality of first inputs, each said first  
5 input being dedicated to a particular one of said drop ports;  
6 a second demultiplexer having a plurality of second outputs,  
7 each said second output being dedicated to a particular one of said add  
8 ports; and  
9 a second multiplexer having a plurality of second inputs, each  
10 said second input being dedicated to a particular one of said drop ports.